MTH1W

Math 9 – Unit 2: Algebra One Name: Mr. Hogan

Lesson 2.4: More Distributive Property and Powers of Monomials Date: Sept 29, 2022.

Learning Goal: We are learning to expand and simplify more complicated expressions.

Let's start off by continuing our lesson on the Distributive Property. Take a look at the following questions:

Expand AND simplify (put your answers in descending order):

a) $3x(4x^2 - 7x + 2) + 4x^2(2x - 3)$

$= 12x^3 - 21x^2 + 6x + 8x^3 - 12x^2$

$= 20x^3 - 33x^2 + 6x$

b) $-4y^2(3y^2 - 5) - 5y^3(6 + y)$

$= -12y^4 + 20y^2 - 30y^3 - 5y^4$

$= -17y^4 - 30y^3 + 20y^2$

c) $3mn(2m - 7n) - 5m^2(4n + 8) + 6n^2(3m - n)$

$= 6m^2n - 21mn^2 - 20m^2n - 40m^2 + 18mn^2 - 6n^3$

$= -14m^2n - 3mn^2 - 40m^2 - 6n^3$

Now we are going to go back to discussing monomials. How do we simplify $\left(3x^2y^5\right)^3$? This is called a monomial raised to a power. How does the outside exponent affect the question? First, how does it work with just a number?

Simplify $\left(4^3\right)^2 = 4^3 \times 4^3$

$= 4\times4\times4 \times 4\times4\times4$

$= 4^6$

The initial exponents were *3* and *2*, with the final exponent a 6. So, 3 x 2 = 6! This leads to our second exponent law. When raising a power to a power, multiply the exponents. Try it out!

a) $\left(x^4\right)^5$ $= x^{20}$

b) $\left(y^2\right)^8$ $= y^{16}$

c) $\left(m^3n^6\right)^4$ $= m^{12}n^{24}$

That's all well and good (hopefully), but how do you handle a question with a coefficient?

Consider the expression from before, $\left(3x^2y^5\right)^3$. Expand it without using the laws.

$(3x^2y^5) \times (3x^2y^5) \times (3x^2y^5)$

$= 27x^6y^{15}$ $\rightarrow 3^3$

The coefficient was just raised to the power of 3! Awesome. Try out some more, this time following the laws.

a) $\left(2x^4y^2\right)^5$

$= 32x^{20}y^{10}$

$\boxed{\wedge}$

$2 \boxed{\wedge} 5 = 32$

$(-3)^2$

Square are always positive.

b) $\left(-3m^7n\right)^2$

① $(-3)^2$

② Exponent law

$= 9m^{14}n^2$

c) $\left(5a^2b^3c^4d^5\right)^6$

$= 15625a^{12}b^{18}c^{24}d^{30}$

① Outside exponents.

d) $\left(3x^2y^5\right)^2\left(2xy^3\right)$

$= \left(9x^4y^{10}\right)\left(2x^1y^3\right)$

multiply

$= 18x^5y^{13}$

e) $\left(-4m^3n^2\right)^3\left(3m^4n^3\right)^2$

$(-4)^3 = (-4)\times(-4)\times(-4)$

$=$

$= \left(-64m^9n^6\right)\left(9m^8n^6\right)$

$= -576m^{17}n^{12}$

f) $\left(16x^2y^3z^6\right)^0 = 1$

g) $\left(3x^2+5x-12\right)^0 = 1$

h) $\left[\left(4x^2y^5\right)^2\left(5x^3y\right)^3\right]^2$

$= \left[\left(16x^4y^{10}\right)\left(125x^9y^3\right)\right]^2$

$= \left(2000x^{13}y^{13}\right)^2$

$= 4000000x^{26}y^{26}$

Success Criteria:

- I can use the distributive property to multiply a polynomial with a monomial
- I can use the distributive property to combine multiple variables into a single term
- I can simplify a monomial raised to a power by multiplying the exponents of each variable
- I can recognize that when a coefficient is raised to a power, it is NOT NOT NOT multiplied
- I can understand that raising to the power of zero equals one.